

Appl. No. 10/757,204
Amdt. dated 09/06/2006
Reply to Office Action of 06/09/2006

Attorney Docket No.: TS02-420
N1085-90169

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application.

1 1. (Currently Amended) A method for obtaining values for optical constants (n and
2 k) for a layer on a substrate comprising:

3 (a) providing a substrate with an organic or inorganic layer formed thereon;

4 (b) performing a spectral ellipsometer (SE) measurement and a broadband
5 spectrometer (BB) measurement of said organic or inorganic layer in an integrated
6 optical measurement system;

7 (c) independent of said performing, determining a thickness for said organic
8 or inorganic layer using an independent optical thickness measurement component
9 based on Beam Profile Reflectometry or Beam Profile Ellipsometry; and

10 (d) determining said values for said optical constants n and k values for said
11 organic or inorganic layer based on said thickness, the spectral ellipsometer
12 measurement, the broadband spectrometer measurement, and modeling information,
13 wherein n represents index of refraction and k represents extraction coefficient.

1 2. (Original) The method of claim 1 wherein said organic or inorganic layer has a
2 thickness in the range of about 300 to 10000 Angstroms.

1 3. (Cancelled)

1 4. (Cancelled)

1 5. (Currently Amended) The method of claim ~~[[3]]~~ 1 wherein the integrated optical
2 measurement systems is an Opti-Probe series measurement system from Thermo-
3 Wave or a system with equivalent capability.

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6. (Currently Amended) The method of claim [[3]] 1 wherein the independent optical thickness measurement component provides experimental data in the form of beam profiles that are matched to modeling data in a processor to arrive at a best fit of experimental data to modeling data.

7. (Original) The method of claim 1 wherein step (d) involves a Critical Point model otherwise known as a harmonic oscillator approximation.

8. (Currently Amended) The method of claim 1 wherein said thickness data is combined with measurement data from said [[SE]] spectral ellipsometer and [[BB]] broadband spectrometer measurements to provide an experimental data output for said organic or inorganic layer.

9. (Original) The method of claim 8 wherein said experimental data output is fitted to modeling data to provide a best fit of experimental data to modeling data.

10. (Currently Amended) The method of claim 9 wherein said best fit of experimental data to modeling data provides said values for said optical constants n and k ~~values~~ for said organic or inorganic layer.

11. (Currently Amended) The method of claim 1 wherein said organic or inorganic layer is a 248 nm photoresist, a 193 nm photoresist, or an anti-reflective (ARC) layer.

12. (Currently Amended) A method for obtaining values for optical constants {n and k} for a top layer in a bilayer film stack on a substrate comprising:

(a) providing a substrate having a stack of layers comprised of a top photoresist layer and a bottom layer formed thereon;

(b) performing a spectral ellipsometer (SE) measurement and a broadband spectrometer (BB) measurement of said top photoresist layer in an integrated optical measurement system;

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- 8 (c) inputting [[a]] an input thickness value and input n and k values for said
9 bottom layer into a program used to make n and k calculations;
- 10 (d) determining a thickness for said top photoresist layer using an
11 independent optical thickness measurement component based on Beam Profile
12 Reflectometry or Beam Profile Ellipsometry; and
- 13 (e) independent of said performing, determining said values for said optical
14 constants n and k values for said top photoresist layer based on data that includes the
15 thickness of said top photoresist layer, the spectral ellipsometer measurement, the
16 broadband spectrometer measurement, and modeling information.

1 13. (Original) The method of claim 12 wherein said top photoresist layer has a
2 thickness in the range of about 1000 to 10000 Angstroms.

1 14. (Currently Amended) The method of claim 12 wherein the thickness as well as
2 the n and k values of said bottom layer were determined prior to forming said top
3 photoresist layer by a process comprising:

- 4 (1) forming said bottom layer on said substrate;
- 5 (2) performing a spectral ellipsometer (SE) measurement and a broadband
6 spectrometer (BB) measurement of said bottom layer in an integrated optical
7 measurement system;
- 8 (3) determining a thickness for said bottom layer; and
- 9 (4) determining said values for said optical constants n and k values for said
10 bottom layer based on the thickness of the bottom layer, spectral ellipsometer
11 measurement of the bottom layer, broadband spectrometer measurement of the bottom
12 layer, and modeling information.

1 15. (Currently Amended) The method of claim 14 wherein the ~~integrated optical~~
2 ~~measurement system is further comprised of an~~ independent optical thickness
3 measurement component ~~that~~ is used to determine the thickness ~~thicknesses~~ of said
4 ~~top photoresist layer and said bottom layer.~~

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1 16. (Currently Amended) The method of claim ~~[[15]]~~ 14 wherein the independent
2 optical thickness measurement component is based on Beam Profile Reflectometry
3 (BPR) or Beam Profile Ellipsometry (BPE).

1 17. (Currently Amended) The method of claim ~~[[15]]~~ 14 wherein the integrated
2 optical measurement system is an Opti-Probe series measurement system for Thermo-
3 Wave or a system with equivalent capability.

1 18. (Original) The method of claim 12 wherein step (e) involves a Critical Point
2 model otherwise known as a harmonic oscillator approximation.

1 19. (Currently Amended) The method of claim 12 wherein the thickness of the top
2 photoresist layer is combined with measurement data from said ~~[[SE]]~~ spectral
3 ellipsometer and ~~[[BB]]~~ broadband spectrometer measurements to provide an
4 experimental data output for said top photoresist layer.

1 20. (Original) The method of claim 19 wherein said experimental data output is fitted
2 to modeling data to provide a best fit of experimental data to modeling data.

1 21. (Currently Amended) The method of claim 20 wherein said best fit of
2 experimental data to modeling data provides said values for said optical constants n
3 and k values for said top photoresist layer.

1 22. (Currently Amended) The method of claim 12 wherein said top photoresist layer
2 is 248 nm photoresist or a 193 nm photoresist and the bottom layer is an organic or
3 inorganic anti-reflective ~~[[ARC]]~~ layer.

1 23. Currently Amended. A method for obtaining values for optical constants (n and
2 k) for a top layer in a trilayer film stack on a substrate comprising:

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3 (a) providing a substrate having a stack of layers comprised of a bottom
4 inorganic layer, a middle organic anti-reflective coating ARC layer, and a top photoresist
5 layer formed thereon;

6 (b) performing a special ellipsometer (SE) measurement and a broadband
7 spectrometer (BB) measurement of said top photoresist layer in an integrated optical
8 measurement system;

9 (c) inputting a thickness and n and k values for said bottom inorganic layer
10 and said middle anti-reflective coating ARC layer into a program used to make n and k
11 calculations;

12 (d) independent of said performing, determining a thickness for said top
13 photoresist layer using an independent optical thickness measurement component
14 based on Beam Profile Reflectometry or Beam Profile Ellipsometry; and

15 (e) determining n and k values for said top photoresist layer based on data
16 that includes the thickness of said top photoresist layer, the spectral ellipsometer
17 measurement, the broadband spectrometer measurement, and modeling information.

1 24. (Cancelled)

1 25. (Currently Amended) The method of claim 23 wherein the thickness for the top
2 photoresist layer is combined with measurement data from said spectral ellipsometer
3 SE and BB broadband spectrometer measurements to provide an experimental data
4 output for said top photoresist layer.

1 26. (Original) The method of claim 25 wherein said experimental data output is fitted
2 to modeling data to provide a best fit of experimental data to modeling data.

1 27. (Currently Amended) The method of claim 26 wherein said best fit of
2 experimental data to modeling data provides said values for said optical constants n
3 and k values for said top photoresist layer.

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- 1 28. (Original) The method of claim 23 wherein said top photoresist layer is a 248 nm
- 2 or 193 nm photoresist and the bottom inorganic layer is comprised of silicon nitride or
- 3 silicon oxynitride.